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GEOPHYSICAL ABSTRACTS

NO. XXVIII

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FREDERICK W. LEE

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DEPARTMENT OF COMMERCE -- BUREAU OF MINES

GEOPHYSICAL ABSTRACTS[1]

No. 28

Compiled by Frederick W. Lee[2]

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1. GRAVITATIONAL METHODS

(315) PERFECTIONNEMENTS A L'INSTRUMENT TRANSPORTABLE POUR LA MESURE RAPIDE DE LA GRAVITE

(IMPROVEMENTS MADE ON A PORTABLE INSTRUMENT FOR QUICK MEASUREMENT OF GRAVITY)

By F. Holweck and P. Lejay

Comptes rendus de l'Académie des Sciences, Paris, vol. 192,
No. 18, 1931, pp. 1116-1119

The principles and construction of an instrument for quick measurement of gravity were explained by the authors in a previous article published in the Comptes rendus de l'Academie des Sciences, vol. 190, No. 24, 1930 (see Geophys. Abs. No. 21, p. 2).

In this article the improvements made on the instrument are described and illustrated by a schematical drawing. The method of observation has also been changed considerably by abolishing the recording and replacing it by direct stroboscopic observation. Fifteen minutes are required for making one observation.

Measurements of gravity were carried out near Dijon in order to test the instrument, and it was established that the new model was ten times more accurate than the old one. The instrument was not affected by being transported in an automobile for more than 2,000 kilometers without any special protection.—W. Ayvazoglou.

(316) GRAVITY GRADIENT AND CURVATURE

By Edith A. Nelson

Philosophical Magazine No. 10, Sept., 1930, pp. 513-516

A survey with the Eötvös balance shows that in certain instances the curvature of the level surface changes sign when the gravity gradient is a maximum, while in other cases this does not hold. Investigation shows that there is no general relation between the quantities, and that this phenomenon is evidence of stratification in that region of the earth's crust, the edge of the stratum being situated below the point of the maximum gradient.—Abstract from Science Abstracts, vol. 34, No. 398, 1931, p. 96.

(317) DAS GEOID

(THE GEOID)

By F. Ackerl

Gerlands Beiträge zur Geophysik, Leipzig, vol. 29, No. 3/4, 1931, pp. 273-335.

In this article Ackerl considers the question of the mathematical figure of the earth according to theories advanced by Hopfner and developed by Bruns, as he thinks it desirable to give numerical calculations of the theoretical results. The article contains the following items:

A. Theoretical argumentations.
B. Observation material.
C. Sources of reference.
D. Remarks to the sources of reference.
E. Lines of equal gravity.
F. Special maps of G lines.
G. World map of lines of equal gravity.
H. Determination of the apparent level spheroid.
I. The world map with the lines of equal apparent gravity anomalies.
K. Special maps of apparent gravity anomalies.
L. The presumable value of the undulations of the geoid.
M. Conclusive remarks.

A translation of the author's abstract reads as follows:

F. Hopfner proposed a hypothesis-free method of determining the shape of the geoids. This method requires values of gravity which are derived from the gravity observed according to well-founded viewpoints established in physics. All values of gravity published till July, 1930 (as far as they were known by the author), are reduced by A. Prey's method to correspond with the sea level of Vienna, which is taken as the starting point.

By using these gravity values a world map is drawn in which the course of lines of equal gravity is shown. The constants of the apparent level spheroid are computed by a preliminary application of the summary method. The calculated anomalies are used for drawing a world map in which the lines of equal apparent gravity anomalies are represented. From the amount and distribution of these anomalies a conclusion as to the amount and distribution of undulations of the geoid with regard to the true level spheroid can be drawn.--W. Ayvazoglou.

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(318) DAS SCHWEREPROFIL DER TAUERNBAHN

(THE GRAVITY PROFILE OF THE TAUERN RAILROAD)

By Robert Schwinner

Gerlands Beiträge zur Geophysik, Leipzig, vol. 29, No. 3/4, 1931, pp. 352-416.

The investigation is based on the determination of gravity made in 1910-1912 along the Tauern railroad and the parallel profile Rauris-Sonnblick-Ober-Drauburg, and especially on the determinations of gravity anomalies $G_0-\gamma_0$ -- that is, on the observed gravity, reduced to sea level according to Bouguer's method, less the normal gravity γ_0, the latter being assumed according to Helmert's formula of 1901. In the first place the question of the density of rocks, which is fundamental to all gravimetric problems, is discussed in general and in particular with respect to the rocks found in the Tauern profile; improvements made on Bouguer's reduction formula at several stations resulted in considerable changes of the final values of anomalies to be applied.

The problem was to find, by investigation based on geological and geophysical premises, a disposition of the subterranean disturbing masses, such that the gravity anomalies $G_0-\gamma_0$ resulting from the reduction of the measurements might be explained by their attraction. Owing to the fact that these "measured anomalies" in this case, as well as in the Alps in general, are all negative only a negative disturbing mass was to be considered--that is, rocks which had a lighter specific weight than the surroundings at the same level.

Local disturbances were caused chiefly by the Tauern granite (density of the disturbing mass = $\delta = -0.15$) and in much less degree by the calcareous phyllite ($\delta = -0.05$) of which only its accumulation on the northern slope was taken into consideration. For the granite resulted as the most probable form, that of a horizontal plate or a flat lens, about 8 to 9 kilometers thick, at the northern border of which a vertical root or a dyke, of at least 5 kilometers in magnitude, is placed. The supposition of some geologists that the granitic masses of the Tauern are dipping at their southern border in the forms of large roots or dykes does not agree with the present determinations of gravity.

The regional negative gravity in the Alpine region is represented (according to Airy) as the effect of a "mass deficiency" caused by the fact that under the Alps the acid rocks of the outer crust (sial) are sinking, owing to their weight, lower into the basic substratum (sima) than the neighboring areas; the form can be simplified and represented as a rectangular Graben in the sima filled with sial ($\delta = 2.8 - 3.1 = -0.3$) descending at the southern border from 30 to 40 kilometers and at the northern border rising in two steps from 40 to 35 and from 35 to 30 kilometers to the normal depth of the sial-sima bordering plain which, according to seismic data, is supposed to be 30 kilometers only. These three steps correspond to the trend line of the principal faults of the Alpine structure; the line of the Drau, of the Salzach and the border of the Alps; it is supposed that the two former are dipping northward and the latter southward. From this assumption a disturbance of gravity is computed which is sufficiently in accordance with the anomalies determined, especially because for the smaller variations (Sonnblick northern slope, Bischofshofen-Hochkönig, Hallein-Berchtesgaden) the local causes of disturbance can be proved as resulting from geological conditions.

Based on these assumptions on the disposition of masses the hydrostatic uplift was estimated, corresponding to the conception resulting from Airy's hypothesis that the floating of sial is similar to the floating of pack ice. Prevailing of weight was established in the region of the Drau; prevailing of uplift was found at the northern border and far beyond the Solzach and prevailing of weight again in the country of Berchtesgaden. This corresponds to the fact that the region of the Drau and the Carinthian Lakes, as well as the region of Berchtesgaden, are proved to be sinking during centuries, while the Tauern and the region to the north, up to the Hochkönig, are being lifted up.

Geologically, the data of the gravity profile and the supposed masses seem to prove that in this region vertical movements play the main part (in some way according to K. Lehmann's "Pingen-Theory") and speak against the horizontal dislocation, the latter idea being recently emphasized too much.

In conclusion some directive lines for the contimuation of the gravity measurements in the Tauern are given.--Author's abstract translated by W. Ayvazoglou.

(319) EIN BEISPIEL ZUR ENTWICKLUNG DES RAUMPOTENTIALS NACH KUGELFUNKTIONEN

(AN EXAMPLE FOR THE RESOLUTION OF THE SPACE-POTENTIAL ACCORDING TO SPHERICAL FUNCTIONS

By K. Jung

Gerlands Beiträge zur Geophysik, Leipzig, vol. 29, No. 3/4, 1931, pp. 346-351.

Using a simple and evident example (a homogeneous oblate ellipsoid of revolution) the author shows that the resolution of the spherical functions of the external space potential can not be applied inside of masses, also not near the surface and even not if the series of the external space potential converges in one part of the mass volume.--Author's abstract translated by W. Ayvazoglou.

2. MAGNETIC METHODS

(320) REPORT ON THE MAGNETIC SURVEYING IN THE YEARS 1924-1925 OF THE MAGNETITE SCHISTS IN THE REGION OF THE KOLA-FIORD AND ON THEIR POSSIBLE ECONOMIC IMPORTANCE (IN RUSSIAN)

By A. S. Purtov

Bulletin of the Geological and Prospecting Service, Moscow, U.S.S.R., vol. 49, No. 10, 1930, pp. 45-72.

The article consists of two parts. In the first the magnetometric survey carried out in 1924-1925 is described; in the second the author gives an economic estimation of the reserves of magnetite deposits based on the data obtained from this survey.

An area of about 110 square kilometers was covered by the survey, 9,500 observations being made. Thalen-Tiberg's magnetometer was used.

The main results obtained by the survey are summed up as follows:

1. The width of the ore-bearing complex was determined to be considerable.
2. The distribution of the separate orebodies in the complex was found to be scattered.
3. A series of new strong anomalies was discovered.
4. The strongest anomalies were found to be in the northern part of the complex.
5. Finally, indications concerning the relations between the different ore types and the intensity of the anomalies were established.

The possible total reserves of all the largest deposits calculated on the basis of the data obtained from the magnetic survey are considered to be about 24 millions tons.--W. Ayvazoglou.

(321) RECONNAISSANCE MAGNÉTIQUE EN SYRIE

(MAGNETIC INVESTIGATION IN SYRIA)

By Jean Chevrier

Comptes Rendus de l'Académie des Sciences, Paris, vol. 192, No. 16, 1931, pp. 977-978.

The purpose of this investigation was to determine the magnetic elements (declination, inclination, intensity of the horizontal component) in the desert regions. The observations were carried out by a theodolite compass (Brunner-Chasselon model No. 3) and an inclination needle (Chasselon model No. 1).

The error in declination may be considered to be about 2 minutes for the most unfavorable conditions. An error of the same order may be expected for inclination. The error in determining the horizontal component has proved to be very small.

A comparison of values obtained during this investigation in Karyatein and in Palmyre with declinations observed by the Carnegie expedition in 1911 in the same places, shows a secular variation of 6.5 toward the east.

The results of observations are given in a table.--W. Ayvazoglou.

(322) GENERAL PRINCIPLES FOR DETERMINING THE EXTENSION AND DEPTH OF AN OREBODY HAVING THE SHAPE OF AN OBLATE ELLIPSOID OF REVOLUTION MAGNETIZED PERPENDICULAR TO THE AXIS OF REVOLUTION (IN RUSSIAN)

By N. Boulgakov and A. Jouravsky

Bulletin of the Geological and Prospecting Service, Leningrad, U.S.S.R., vol. 49, No. 5, 1930, pp. 61-73.

In this paper the authors study the magnetic field of an orebody having the shape of an oblate ellipsoid of revolution and being magnetized in the direction perpendicular to the axis of revolution. Tables are computed with the aid of which the components X, Y, and Z for different points of the field may be easily determined.--W. Ayvazoglou.

3. SEISMIC METHODS

(323) SHOCK DISPERSION

By K. Sezawa and G. Nishimura

Bulletin of the Earthquake Research Institute, Tokyo, vol. 8, No. 3, 1930, pp. 321-337.

That part of transmitted waves dispersed by an echoing medium is not of regular form, while the oscillatory part of ordinary dispersed waves is quite regular and has gradually varying wave length. In echoed dispersion the leading part is distinct and has large amplitude. In ordinary dispersion both leading and trailing parts have their own velocities of propagation. A portion of the vibrations of echoing dispersion is of a gradually decaying type, whilst in ordinary dispersion this is not in general possible.--Author's abstract.

(324) SEISMOGRAPHEN IM DIENSTE DER GLETSCHERFORSCHUNG

(SEISMOGRAPHS IN THE SERVICE OF GLACIER INVESTIGATION)

By Hans Mothes

Forschungen and Fortschritte, Berlin, vol. 6, No. 28, 1930, pp. 363-365.

The importance of a knowledge of the thickness of glacier ice in geophysical prospecting, as well as in climatology and the study of isostatic equilibrium of the earth crust, was the cause of investigations of glaciers by means of geophysical methods which have been undertaken since 1925.

In this article the author gives a description of his first practical work on glacier investigations carried out in August, 1926, in Hintereisferner (Ötztaler Alps). This place was chosen because it had already been extensively studied by H. Hess.

Wiechert's field vertical seismometer was used. Seismograms as well as travel-time curves are given in figures. Of special interest are curves showing hyperbolic form, as theoretically they represent waves reflected in the underground during their path from the point of explosion to the point of observation. Greater distances of these curves from the abcissa indicate greater thickness of the ice stratum and vice versa. The path of these waves and therefore the depth of the reflection underground could be calculated from the travel time taken from the seismograms; of course their velocity was to be known. This velocity has been established to be 3,600 meters per second.

The correctness of data obtained by seismic method of investigation was proved by borings carried out by Hess and others, as well as by additional investigations made by the author and published in Zeitschrift für Geophysik, vol. 6, Nos. 3-4, 1929 (see Geophys. Abs. No. 9, p. 13). Similar investigations were made by the author in August, 1929, on the Pasterze Glacier (Eastern Alps) and were published in Zeitschrift für Geophysik, vol. 6, No. 8, 1930 (see Geophys. Abs. No. 21, p. 7).—W. Ayvazoglou.

(325) ÜBER DIE HERDTIEFE DER ERDBEBEN

(ON THE DEPTH OF EARTHQUAKES' FOCI)

By Gerhard Krumbach

Forschungen und Fortschritte, Berlin, vol. 6, No. 32, 1930, pp. 419-420.

Two methods for the determination of the focus of an earthquake are pointed out by the author:

1. The macroseismic method -- in which the propagation of the intensity of a quake on the surface of the earth as resulting from observed shocks and destructions in the area of the quake is studied (determination of isoseismal lines).

2. The microseismic method -- in which the records of seismic instruments are used and the periods of time of propagation of definite forms of seismic waves are studied in dependency from the distance of the focus; that is, travel-time curves are drawn (determination of isochronous lines). Both methods are discussed. Krumbach concludes that although a series of important results on investigations concerning the depth of the foci of earthquakes have already been obtained, this work must be continued in order to get valuable information on the structural changes inside of the earth crust.--W. Ayvazoglou.

(326) ON DEEP-FOCUS EARTHQUAKES

By R. Stoneley

Gerlands Beiträge zur Geophysik, Leipzig, vol. 29, No. 3/4, 1931, pp. 417-435.

Professor Turner has found that the foci of earthquakes may occasionally be situated as low as 0.09 of the earth's radius below normal; that is, they may occur 580 kilometers below the surface.

Allowance for the known errors of the Zöppritz-Turner tables would probably reduce these depths considerably.

According to a general reciprocal theorem in dynamics, since the amplitudes of surface waves fall off rapidly at great depths, the surface waves of deep-focus earthquakes should be small or insensible. Yet the International Seismological Summary gives L and M readings even for the deepest foci contemplated.

It is here shown that in some of the deepest focus earthquakes, the recorded L and M are scarce and often nonexistent at great distances. The recorded observations mostly refer to S, SS, SSS, etc., or else to Gutenberg's early long wave G, for which the almost complete extinction is not to be expected, as the period is very long.

The actual records of these very deep-seated shocks show a very conspicuous P, a large S, SS, and further disturbances, and no L or M. The amplitudes of the general disturbance at the calculated positions of L and M are smaller, often much smaller, than that of P.

Finally, a tribute must be paid to the pioneer work of the late Professor Turner. His deep-focus earthquakes, even if not of such great depth as he thought, have at any rate a focus in some cases far below normal.--Author's abstract.

(327) SEISMOMETRIC STUDY OF THE RECENT DESTRUCTIVE NORTH IDU EARTHQUAKE

By A. Imamura

Bulletin of the Earthquake Research Institute, Tokyo, vol. 9, No. 1, 1931, pp. 36-49.

In this article Imamura describes seismometric studies carried out in connection with the earthquake in North Idu which occurred on November 26, 1930. The results of the investigation are summed up as follows:

1. Of various earthquake phenomena, the outstanding one is the relation between the distributions of faults and seismic intensities. Of the number of faults that appeared, four were found especially noteworthy; a description of them is given.

2. Another characteristic feature was observed in the seismograms obtained at Tokyo. The result of the study of the diagrams is given in a figure. It shows the time of the commencement and of the duration of the tremors, and the period and amplitude of the S phase. Further analysis shows that the earthquake consisted of waves which may be regarded as having emerged from four different sources.

3. Another interesting feature is the presence of vibrations of a period of some 10 seconds from the very beginning to the last, and attaining after 30 seconds from the commencement a double amplitude of so much as 14.7 centimeters—largest amplitude so far perfectly recorded with instruments in Japan. These long waves were propagated to Tokyo first as waves of dilatational type and then as those of distortional type; they may be regarded as caused by the bodily movement of the crustal block constituting the seismic region.

The block movement thus seems to have started somewhere near the middle point of the fault system and passed on one hand quietly over the meridional fault toward the north and on the other hand toward the south, sharp destructive shocks having emerged from both of the three oblique faults.—W. Ayvazoglou.

4. ELECTRICAL METHODS

(328) SALT DOME STUDIES BY GEOELECTRICAL METHODS

By Karl Sundberg

The Petroleum Times, London, vol. 25, No. 638, 1931, p. 507.

After a brief explanation of Swedish electromagnetic method for structural studies, Sundberg concludes that geoelectric methods were successful in the detailed determinations of the flank conditions of salt domes, and especially in locating faults against which oil might accumulate, discovered in the Gulf Coast region by geophysical, chiefly seismic, methods.

Two figures representing electromagnetic investigations across salt-dome structures are given.--W. Ayvazoglou.

5. RADIOACTIVE METHODS

(329) ULTRA-PENETRATING RAYS

By H. Geiger

Nature, London, vol. 127, No. 3212, 1931, pp. 785-787

In this article the author discusses the results obtained from experiments on the origin and nature of γ-radiation carried out by methods improved during the past few years in the following two directions: (1) along electrometric lines by the registration and the application of high-pressure chambers, and (2) by the method of electron counting. In the pressure chamber the degree of ionization produced in the gas by the ultra radiation is measured, while in the tube electron counter the high-velocity electrons coupled with the ultra radiation are registered singly.--W. Ayvazoglou.

(330) EINE EINFACHE METHODE ZUR AUTOMATISCHEN REGISTRIERUNG VON KOINZIDENZEN IN GEIGER-MÜLLERSCHEN ZÄHLROREN

(A SIMPLE METHOD FOR AUTOMATIC RECORDING OF COINCIDENCES IN GEIGER-MÜLLER'S TUBE COUNTERS)

By J. N. Hummel

Die Naturwissenschaften, Berlin, vol. 19, No. 18, 1931, pp. 375-376.

An arrangement by which two tube counters are electrically connected one with another in order to obtain direct coincidence measurements is described.

Owing to this arrangement the amplitude of the deflection of the electrometer is considerably increased.

The manner of connection is shown in a figure.--W. Ayvazoglou.

(331) STRAHLUNG VON ANTENNEN UNTER DEM EINFLUSS DER ERDBODENEIGENSCHAFTEN

(ANTENNAE RADIATION UNDER THE INFLUENCE OF SOIL PROPERTIES)

By M. J. O. Strutt

Annalen der Physik, Leipzig, vol. 9, No. 1, 1931, pp. 67-91.

In the first two sections of the article the author describes the arrangement and verification of a tubular sender and a tubular receiver provided with amplifier and a tubular voltmeter for 1.42 meters wave length. The main importance was laid to the work of the measurement arrangement exclusively by antennae, avoiding any parasitic radiation.

With this arrangement the electrical soil properties were measured by using 1.4 meters wave length according to a new method. A larger value of the index of refraction of the ground was obtained than that which results from the properties of the same soil measured at about 15 meters. The most probable explanation was thought to be the fact that the conductivity of the earth for very short waves (about 1 meter) increases considerably with the decrease of the length of the wave.

This behavior was established for the soil consisting of sand, humus, clay, and grassland. In case of water the measured index of refraction agreed with theoretical expectation ($80 = \mathcal{E}$).

Measurements concerning the direction of polarization of waves emitted from the vertical and horizontal antennae had also shown a great index of refraction of the earth. The theory could be verified by measuring radiation diagrams in a vertical plane; especially the theoretical expectation that the received field strength in vertical sending antennae increases close to the ground in proportion to the height above the ground. These measurements also had shown a large index of refraction of the earth. Finally, the dependency of the strength of receiving from the distance between the sender and receiver was measured for the vertical and horizontal sending antennae. Here the theoretical expectation, established first by von Hörschelman, according to which the distance law in case of the two kinds of antennae is the same, was confirmed.--Author's abstract translated by W. Ayvazoglou.

(332) GEOLOGISCHE UND GEOPHYSIKALISCHE (RADIOACTIVE) UNTERSUCHUNGEN AM WESTRANDE DES GÖTTINGER LEINENTALGRABENS

(GEOLOGICAL AND GEOPHYSICAL (RADIOACTIVE) INVESTIGATIONS ON THE WESTERN BORDER OF THE GÖTTINGEN GRABEN OF THE VALLEY OF THE LEINE)

By Valeriu Patriciu

Abhandlungen der Preussischen Geologischen Landesanstalt, Berlin, No. 116,
1930, pp. 163-194.

This article consists of two parts; the first deals with the geological and the second with the geophysical (radioactive) investigation of the region mentioned in the title. Only the second part is considered in this abstract.

Contents of the second part:

1. Introduction. A brief historical outline of previous works on radioactive methods of investigation is given.

2. Apparatus. The apparatus used was that constructed by R. Ambronn (described in the Physikalische Zeitschrift, 1925, pp. 444-446); the method described in Ambronn's book, Methoden der Angewandten Geophysik, has been followed in general.

3. The plan of the work and the measurement procedure. The most practical way of carrying out the work is described; points of measurement to be selected along a straight line were fixed at about 8 meters distance one from another, the distances to be shortened to 4 or 2 meters only after abnormal distribution of emanation is observed. Holes of 3 centimeters in diameter and 80 to 100 centimeters in depth for inserting probe tubes are bored. The radium emanation of the ground is pumped into the ionization chamber. The reading of the position of the electrometer string is made every 30 seconds.

4. Preliminary tests to determine errors in the values of the measurements. The sources of these errors were eliminated by technical means.

5. Measurements for revealing the structure of the earth's crust. Plan of investigation; carrying out of measurements and graphical representation of the results; the results.

6. Limits of inaccuracy. The causes as well as the order of the errors were examined, and their influence upon the final results was established.

7. Concerning the reasons of higher radioactivity in tectonic fissures. Explanations are given.

In conclusion the author summarizes the results of geophysical investigation as follows:

1. The possibility of the application of the radioactive methods as developed by Ambronn for the explanation of tectonic questions in the regions of Saxony's disturbances is proved.

2. Material for the examination of the factors on which the success of the radioactive measurements depends is collected.

Maps of the region under investigation and a table with curves of radioactivities along the profiles are added.--W. Ayvazoglou.

(333) APPARATUS WITH CLOSED AIR CURRENT FOR THE DETERMINATION OF RADIOACTIVITY OF LARGE MINERALOGIC COLLECTIONS (IN RUSSIAN)

By V. Dubov and K. Pogodaev

Bulletin of the Geological and Prospecting Service, Leningrad, U.S.S.R., vol. 49, No. 9, 1930, pp. 100-101.

The apparatus described in this article is an improvement of a similar apparatus constructed by S. Artsybyshew and V. Pleshanova (see Geophys. Abs. No. 8, 1929, p. 18). The size of the metallic chamber in which the box containing the samples to be investigated is placed is reduced to 55 by 55 by 14 centimeters. The central part of the chamber has a raising of the form of a truncated cone, inside of which a ring-shaped commutator is fixed. Inside of the chamber, at 1.5 centimeters from its top and 4 centimeters from its walls,

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a cover is placed; this cover is provided in the center with a tube 11 centimeters in diameter and 4 centimeters in height in which a propeller is inserted; the propeller is put in rotation by means of an electromotor.

The air driven by the propeller from the ionization chamber passes by the commutator, enters in the upper part of the apparatus, and returns again into the ionization chamber.

The current is measured by an electroscope provided with a reading microscope. Commutators of 9 to 13 centimeters in diameter and a capacity of 8.6 to 10 centimeters were used. Four disks coated with a thin layer of U_3O_8 were distributed over the bottom of the box of the size, 52 by 52 by 6 centimeters.

The results of observations are given in a table. A schematical design of the apparatus is shown in a figure.--W. Ayvazoglou.

6. GEOTHERMAL METHODS

(334) ZUSAMMENHANG ZWISCHEN DER GEOTHERMISCHEN TIEFENSTUFE UND DER WÄRMELEITFÄHIGKEIT DER GESTEINE

(RELATIONSHIP BETWEEN THE GEOTHERMAL DEPTH GRADIENT AND THE HEAT CONDUCTIVITY OF ROCKS)

By H. Börger

Glückauf, Essen, vol. 67, No. 17, 1931, pp. 545-551.

The article is divided into two chapters: (1) Investigation of the influence of the heat conductivity of rocks upon the geothermal gradient, and (2) heat-conductivity of various rocks.

From the investigations on the relationship between the heat conductivity of rocks and the geothermal gradient the author draws the conclusion that geothermal gradients have different values in different rocks deposited in layers and that their ratio depends on the heat conductivity of the different kinds of rocks.

The numerical value of the geothermal gradient inside of a certain type of rock depends not only on its capability of conducting heat but also on the ratio of magnitude of rocks overlying one another.

The author gives examples showing that in rocks, the geothermal gradient of which is high owing to their good heat conductivity, the temperature may be unusually high if the deposits overlying them have a lower heat conductivity. The differences in heat conductivity of single types of rocks are sufficient for the explanation of the unusually high temperatures often observed in salt mines and coal mines, without the necessity of assuming the existence of special sources of heat.

The article is illustrated by four figures.--W. Ayvazoglou.

(335) DEEP GOLD MINES AND GEOTHERMAL GRADIENTS

Editorial note

Engineering and Mining Journal, New York, vol. 131, No. 10, 1931, p. 447.

Geothermal gradients as established in some deep gold mines are mentioned in this note. The data may be of interest; they are:

1. The temperature at the 4,300-foot depth of the Kirkland Lake gold mine in Ontario is only 69° the increment being about 1° for every 150 feet.

2. In the St. John del Rey property, in Brazil, although the mine is at an altitude of 3,000 feet, the rock temperature at current working depths of below 7,100 feet is 127°, the geothermal gradient being about 1° for every 140 feet.

3. At the Kennedy, in California, the geothermal gradient was found to be 153 feet per degree, giving a rock temperature of about 91° on the 4,950-foot level.--W. Ayvazoglou.

7. UNCLASSIFIED METHODS

(336) APPLIED GEOPHYSICS

By A. Broughton Edge

Nature, London, vol. 127, No. 3212, 1931, pp. 783-785.

In this article the author gives a review of the recently published book entitled Applied Geophysics: A Brief Survey of the Development of Apparatus and Methods Employed in the Investigation of Subterranean Structural Conditions and the Location of Mineral Deposits, by Capt. H. Shaw, with the assistance of J. McG. Buckshaw and S. T. Newing (see Geophys. Abs. No. 25).

In the introduction to the review Edge says:

> In opening to the public a geophysical exhibition and in publishing a handbook which not only is descriptive of the exhibits but also constitutes an admirable historical résumé of and introduction to the study of applied geophysics, the Science Museum, South Kensington, has taken an important step in promoting the development of this branch of science, a step which is particularly appropriate at the present moment in view of the growing appreciation in Great Britain of the practical value of these relatively new methods of exploration.--W. Ayvazoglou.

(337) ARTICLES APPEARING IN THE TRANSACTIONS OF THE AMERICAN GEOPHYSICAL UNION, TWELFTH ANNUAL MEETING, APRIL 30, AND MAY, 1, 1931, HELD IN WASHINGTON, D. C.

National Research Council of the National Academy of Sciences, Washington, D.C., June, 1931.

The present volume includes the transactions of the twelfth annual assembly. The year's activities of the Union and on the Stockholm meeting and on proposed geophysical work in polar regions and resolutions submitted by the several sections were adopted. The individual section meetings were marked by numerous progress reports on the geophysical activities not only in the United States but also in Canada and Mexico.

The first part of the volume (pp. 7-34) deals with reports and papers presented to the general assembly. The contents are as follows:

1. Resolutions adopted: On gravity at sea; on internal cooperation in the study of tidal waves; on comparisons of new types of seismological instruments developed in the U. S. with various types developed in Europe; commemorating fiftieth anniversary of General Greely's participation in the First International Polar Year; and on the death of Franklin G. Tingley.

2. A short report on the Stockholm Assembly and on proposed geophysical work in polar regions, by J. A. Fleming.

3. Symposium on time signals: (a) United States Naval Observatory time-service, by J. F. Hellweg; (b) Time signals for electrical and physical measurements, by Frank Wenner; (c) Time signal needs for geodetic work, by Edwin J. Brown; (d) Letters bearing on symposium from J. B. Macelwane, Harry O. Wood, and B. Gutenberg; (e) Establishment of world time, by F. W. Lee; (f) The service available from the standard-frequency transmissions of the Bureau of Standards, by J. H. Dellinger; (g) The accuracy of the primary frequency standard of the Bureau of Standards, by Charles G. McIlwraith; and (h) Informal communications by C. W. Horn, H. A. Affel and W. A. Marrison.

In the following parts of the volume the papers presented in various sections are discussed:

The Section of Geodesy (pp. 35-58). Gravity work, instrumental progress, the moon's influence on latitude, and the establishment astronomically of points on an unsurveyed line were presented in the following papers: (a) Progress report on the absolute determination of gravity at Washington, D.C., by Paul R. Heyl; (b) Mexican gravity stations in 1930 and first calculations and corrections for topography and isostasy, by Elfego Ruiz; (c) Gravity at the Stockholm meeting of the International Geodetic and Geophysical Union, by Walter D. Lambert; (d) Progress report on graduation and calibration of precision-circles, by Lewis V. Judson; (e) Further investigations of the moon's influence on latitude, by H. T. Stetson; (f) The establishment astronomically of points on an unsurveyed provincial boundary, by Noel J. Ogilvie; and (g) Progress in geodetic work during the past year, by William Bowie.

The Section of Seismology (pp. 59-78). Attention was devoted to theoretical considerations, relations of geodetic operations to seismological interpretations, registration of time signals, progress reports on instrumental developments, and the provision made to realize the Union's resolution at its eleventh annual assembly to establish a seismological observatory in South America (near Huancayo, Peru). The following papers were presented in connection with these questions: (a) Velocity of explosion-generated longitudinal waves in a nepheline syenite, by L. Don Leet and Maurice Ewing; (b) Geodetic work lays the basis for study of earth movements, by William Bowie; (c) Registration of the time signals at Georgetown, by F. W. Sohon; (d) The origin of earthquake waves, by Harry Reid; (e) Report on proposed establishment of a seismological observatory at Huancayo, Peru (read by the secretary); (f) Report of progress on accelerometer for recording earthquake shocks, by G. L. Hosmer; (g) Progress report on development of instruments, by Frank Wenner and McComb; (h) The development of a tilt-meter, by George E. Merritt; (i) Progress report on development of seismological instruments, by H. E. Comb; (k) Report on the construction of a 3-drum seismograph recorder, by W. H. Reynolds; (l) Observations of development in instruments at the Seismological Research Laboratory in Pasadena, by N. H. Heck; and (m) Memorandum on the New York earthquake of April 20, 1931, by Frank Neumann.

The Section of Meteorology (pp. 79-90). Much time was given to discussion of the international polar year prospects, followed by a report on the Madrid meeting in March, 1931, of the international commission for the exploration of the upper air, discussion of proposed international cloud atlas and papers on atmospheric turbidity, measurement of color of sea and sky, and cyclical variations in relation to long-range weather forecasting. Nine papers were presented.

Section of Terrestrial Magnetism and Electricity (pp. 91-144). The papers presented to this section were given in four groups relating to (1) the year's investigations in progress in the United States; (2) the Stockholm assembly, (3) extraterrestrial considerations, and (4) polar research. The list of the papers is as follows: (a) magnetic work of the United States Coast and Geodetic Survey, 1930-31, by D. L. Hazard; (b) Field and laboratory investigations of the Carnegie Institution of Washington, by J. A. Fleming; (c) Recent developments in radio-transmission measurements, by G. W. Kenrick and G. W. Pickard; (d) The U. R. S. I. cosmic radio broadcast, by Watson Davis; (e) Reports of geomagnetic and electric work of organizations and individual investigators in the United States, 1930-31, by Harlan W. Fisk; (f) Reports submitted on work in terrestrial magnetism and atmospheric electricity (fourteen papers); (g) The Stockholm assembly of the International Union of Geodesy and Geophysics—Proceedings of the section of Terrestrial Magnetism and Electricity, by H. D. Harradon; (h) Investigations at the Perkins Observatory of changes in the Kennelly-Heaviside layer as a function of lunar altitudes, by H. T. Stetson; (i) Notes on correlation investigations between Kennelly-Heaviside layer and lunar altitudes, by Greenleaf W. Pickard; (k) Use of magnetic data for investigating radiation from the sun, by J. Bartels; (l) The electrical state of the sun, by Ross Gunn; (m) The ultraviolet-light theory of comet activity, by H. B. Maris; (n) Magnetic observations on a moving ice floe, by W. J. Peters; (o) Isomagnetic charts of the arctic area, by Harlan W. Fisk; (p) Significance of geoelectric data from the polar regions, by O. H. Gish; and (q) A Fort Conger polar expedition program, by H. B. Maris.

The Section of Oceanography (pp. 145-180). The communications presented to this section were chiefly progress reports showing excellent development of oceanographical work in the United States by governmental and private organizations (11 papers).

Section of Volcanology (pp. 181-186). Five papers were given relating to the solubility of water in granite magmas, and to the Merapi, Katmai district, Cripple Creek, and Valles Mountain volcanoes.

Section of Hydrology (pp. 187-229). The meeting of this section was devoted to statements of the formal organization of the section (14 papers were presented).—W. Ayvazoglou.

(338) ENTWICKLUNG UND STAND DER GEOPHYSIKALISCHEN DURCHFORSCHUNG DER SÜDSTAATEN VON U. S. A.

(DEVELOPMENT AND CONDITION OF GEOPHYSICAL EXPLORATION OF THE SOUTHERN STATES OF THE U. S. A.)

By Rudolf v. Zwerger

Petroleum Zeitschrift, Berlin, vol. 27, No. 19, 1931, pp. 335-347.

The author divides the southern States, the development and conditions of geophysical exploration of which is discussed in this article, into four large regions:

1. The Gulf embayment.
2. Bend Arch and Balcones fault zone.
3. Permian Basin of west Texas and New Mexico.
4. The Amarillo-Wichita-Arbuckle mountains with the bordering parts of north Texas and south Oklahoma.

The use of various geophysical methods with respect to these regions is discussed. The difference in geological conditions and their effect upon the development of geophysical work during the last years is mentioned.

In conclusion the author gives a prospect on the future possibilities of geophysical exploration in the southern States.—W. Ayvazoglou.

(339) PROGRÈS DE LA GEOPHYSIQUE APPLIQUÉE

(PROGRESS OF APPLIED GEOPHYSICS)

By J. B. Ostermeier-Althegnenberg

La Revue Pétrolifère, Paris, Nos. 425, 426, 427, 1931, pp. 655-659, 685-688, and 717-720.

The original article was published by the author in the Internationale Zeitschrift für Tiefbohrtechnik, Erdölbergbau und Geologie, vol. 38, 1930. The article appearing in the Revue Pétrolifère is a translation made by Pierre Pelecier.

Magnetic, gravimetric, seismic, and electrical methods of prospecting are discussed and illustrated by examples; figures and diagrams are added. In the last part of the article the author gives a description of improvements made by him on the field balance (Askania) in order to increase the precision and rapidity in measurements of the vertical terrestrial magnetic intensity. The problem of lessening the influence of the ground by elevating the instrument is partly solved by providing the instrument with a horizontal instead of a vertical visual apparatus; some other improvements are described, especially those concerning the influence of variations of temperature. The time necessary for one observation was reduced to about 7 minutes, as compared with 15 to 20 minutes required by the instruments used so far.--W. Ayvazoglou.

(340) GEOPHYSICAL INVESTIGATIONS CARRIED OUT IN THE SALT-DOME AREAS OF THE GULF COAST OF TEXAS AND LOUISIANA

By Carl Schmidt.

The Petroleum Times, London, vol. 25, No. 638, 1931, pp. 508-509.

Some of the results which had been derived from the use of seismic methods, either alone or in conjunction with the gravimetric method, in the salt-dome areas of the Gulf Coast of Texas and Louisiana since 1924 are described and the most important discoveries mentioned. Schmidt concludes that the extensive use of seismic method, as well as other geophysical methods of investigation, had resulted in the finding and exploitation of oil fields of enormous value, enabled oil companies to avoid the expenditure of vast sums of money in fruitless drilling, and had made it possible for operators to plan successful and economical drilling campaigns for many years ahead.--W. Ayvazoglou.

(341) THE PROGRESS OF GEOPHYSICS

Editorial note

The Petroleum Times, London, vol. 25, No. 638, 1931, p. 510.

This article refers to the exhibition at the Science Museum in London of apparatus and equipment used in geophysics.

Many types of instruments now in use for geophysical prospecting by magnetic, gravitational, and seismic methods are represented. A special brochure to assist students to get maximum value from a study of the exhibits has also been prepared.--W. Ayvazoglou.

(342) SEARCHING FOR MINERALS WITH SCIENTIFIC INSTRUMENTS

By E. Lancaster-Jones

Journal of Scientific Instruments, London, vol. 8, No. 2, 1931, pp. 34-44.

A series of physical instruments recognized as valuable aids in the search both for mineral deposits directly, and for structural features which may be favorable to mineral accumulation is described.

The instruments are divided into four main groups, characterized as gravitational, magnetic, seismic, and electrical, in relation to the particular physical magnitudes of which each group serves to measure the variation.

1. Gravity method. The Eötvös torsion balance, the balance improved by L. Örtling, and that improved by the author and Captain Shaw (manufactured by the Cambridge Instrument Co., Ltd.) are described and photographs of them are given.

2. Magnetic method. Dip needle devised by Lloyd, Schmidt's portable vertical variometer, and a portable horizontal variometer devised by Walker are mentioned.

3. Seismic method. Mechanisms for amplifying a vibration are explained and the question as to how this type of apparatus can be used in prospecting is considered. A seismograph manufactured by the Cambridge Instrument Co. is demonstrated.

4. Electrical method. Three methods (potential, resistivity, and electromagnetic) are discussed, and the apparatus used is explained.--W. Ayvazoglou.

8. GEOLOGY

(343) THE SALT-DOME AREA WEST OF CELLE, GERMANY

By Carl Schmidt

The Petroleum Times, London, vol. 25, No. 638, 1931, p. 508.

Notwithstanding the numerous boreholes that had been sunk, very little was known about the actual size and shape of the two salt domes (Wietze and Hambühren) of the north German plain. The questions whether these domes were separated from each other or whether there was a connection between them had not been determined. In order to decide this question seismographical investigations were carried out. The question for determining the actual size and shape of the domes had been solved by seismic, as well as gravimetric, investigations.

These investigations carried out in the area of Wietze-Hambühren-Wittbeck-Wolthausen-Meissendorf revealed unexpected and very important geological conditions. It was determined that:

1. Instead of there being two domes there was in fact only one large dome.

2. That part of the dome around Hambühren was much larger and had an entirely different shape than was anticipated.

3. In the direction of the south southwest-north northeast prolongation of the Hambühren dome there was another salt upthrust.

4. The dome of Meissendorf at its southern part had an elongation toward the southeast in the east southeast-west northwest direction.

The results of geophysical investigations also confirmed the importance of the two tectonic lines of dislocation, in directions mentioned in 3 and 4, in the underground structures of the north German plain, and showed that the occurrence of salt upthrusts was connected with such lines of tectonic dislocation, especially with the intersections of the predominant striking directions.—W. Ayvazoglou.

9. NEW BOOKS

(344) Edge, A. B. Broughton, and Laby, T. H. Principles and practice of geophysical prospecting. Edited by Edge and Laby. Pp. XIV + 380. With 261 illustrations in the text. Price, 15 s. net. Cambridge University Press, London, Fetter Lane, E. C. 4; New York, Toronto, Bombay, Calcutta, Madras. MacMillan, 1931. A report of the Imperial Geophysical Experimental survey.

(345) Emmons, William Harvey. Geology of petroleum. 736 pages, 435 illustrations. McGraw-Hill Book Co., 1931, New York City. Price, $6. The work may be broadly divided into two sections. One of these deals with the general principles of oil geology. The second section describes the features of the main oil fields of the world, and gives innumerable references. The book is profusely illustrated.

(346) Kaiser, August. Beitrage zur Physikalischen Erforschung der Erdrinde, Heft 2: Magnetische Messungen in Nordwestdeutschland. (Report on physical research in the earth crust. Part 2: Magnetic measurements in northwest Germany.) 50 pages, 3 tables, 5 figures. Issued by the Preussische Geologische Landesanstalt, Berlin, 1930, Price, R.M. 7.50.

10. PATENTS

(347) GRAVITATIONAL BALANCE

K. D. Sabaneev

Russian patent 14,274 Patent issued March 31, 1930.

The gravitational balance described in this patent is put under a bell from which the air can be partly exhausted; a special arrangement for reading is made and a polished ball, serving as an artificial illuminating point, is used for photographic recording of the indications of the balance.

Claims allowed - 3.

(348) SEISMOGRAPH

G. M. Polonsky and V. G. Leshchinsky

Russian patent 15,527 Patent issued May 31, 1930.

The construction of the seismograph disclosed in this patent is characterized by the application of a Rochelle salt plate secured in an isolated holder and connected by one end with the net of an amplifying lamp and by the other end with the ground and one pole of the battery producing the glowing of the lamp, in the anode circuit of which an electric recording apparatus is inserted.

Claims allowed - 1.

(349) APPARATUS FOR TESTING THE RADIOACTIVITY OF ROCKS

M. J. Sumgin

Russian patent 16,787 Patent issued Sept. 30, 1930.

The apparatus described in this patent and assigned for testing the radioactivity of rocks consists of a hollow cylinder in the lower end of which a movable bottom of the form of a truncated cone, turned with its top downward, is inserted; the walls of this cone are covered with a thin layer of zinc sulphide or platinocyanide barium; the bottom has an opening in which a plate assigned for carrying the sample of the rock to be investigated is inserted; the upper end of the cylinder has a cover provided with a microscope serving for observation.

Claims allowed - 1.

(350) METHOD OF CONTOURING ORE DEPOSITS

L. N. Bogoiavlensky

Russian patent 12,953 Patent issued Jan. 31, 1930.

The method of contouring ore deposits disclosed in this patent is characterized by the following proceeding: At the points of a net plotted on the terrane, the "half value period" of the decay of any radioactive matter is determined, then the points with equal values of these points are connected by curves; based on the form of the curves having equal "half value periods" of the decay, the contour of the ore deposit by which the change of the half value period of the decay is caused is drawn on a plane.

Claims allowed - 1.

(351) METHOD OF PROSPECTING FOR ORE

A. G. Tarkhov

Russian patent 17,515 Patent issued Sept. 30, 1930.

The method described in this patent in which heterodine is used, based on its property of changing one of its contours under the influence of ore deposits, is characterized by an arrangement such that the antenna connected with one of the contours of the heterodine is placed inside of a metallic screen, the latter being provided with a slot. In adjusting the apparatus the slot is covered with a metallic plate. The screen can be rotated by means of a device operated by hand. After the adjustment of the apparatus for the investigation of the ground (disappearing of sound in the telephone) the slot is opened and the screen rotated. The appearance of a sound in the telephone shows that in the direction of the slot there is an ore deposit.

Claims allowed - 2.

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